RS-485 Communication for EDS1000

Solution Introduction:

Northeast of China is one of the largest base in scale for edible mushroom's export, manufacture and production. As the production capacity growth, the poor and aged production equipments arise. Secondary fermentation of nutrient medium is the based and key process in edible mushroom production enterprise. They normally have six channels for nutrient medium secondary fermentation, with eight temperature sensors assembled in input & output ventilation port and nutrient medium to detect the temperature of fermentation process in each channel. In each channel contains one blower and ventilation door to adjust channel temperature to get to the fermentation effect. Currently, they detect channel temperature and adjust blower speed, ventilation door opening by man. Their low automation level, high energy consumption, manpower resource waste appears.

In traditional PLC variable frequency control integrated system, frequency inverter's functions Stop/ Start and Failure Monitoring are controlled by PLC through switching value from port to port. PLC by analog value output terminal output 0~5 (10) V or 4-20mA signal control to achieve variable frequency of VFD, while it need PLC adopt expensive analog value output terminal module. When VFD failure arising, PLC will read the failure alarm contactor, and then need to check the alarm information and reread the VFD specification to know the concrete failure causes. As the development of ac variable frequency control system and communication technology, now we can make use of PLC and VFD serial communication mode to achieve VFD controlled by PLC.

In industry automation control system, PLC and VFD combination application is the common mode. It results in various PLC control means. RS-485 communication solution is widely used to achieve automation control. It has strong anti-jamming capacity, high transmission speed, distant transmission and low cost.   We can provide solution, by apply with PLC and VFD serial communication can achieve blower variable frequency and remote monitoring in edible mushroom production.

1. Inverter Communication Configuration

1.1 Inverter Selection.

EDS-1000 系列变频器   EDS-1000 系列变频器

ENC Brand EDS1000 series VFD support serial communication technology. EDS1000 series VFD support modes containing Standard RS-485, PROFIDRIVE, LONWORKS and other fieldbus modes. Among them, RS-485 serial communication is the economy and practical way, and no needs charge extra any more. Only sending data according to the communication data structure, control and status word of EDS1000 specification, then it can achieve communicate with VFD.

1.2 PLC Selection

Siemens automation products are used widely in automation application. S7-200 series is one of SIMATIC PLC family small PLC member. S7-200 PLC character function, free communication port mode can allow client to choose their wanted communication protocol and is convenient to connect PLC to VFD in system. PLC communicate with VFD by free communication port mode and control VFD operation to read VFD voltage, current, power, frequency and overvoltage, overflowing, overload and other whole alarm information. It's much more reliable than outside terminal connection controlling VFD operation. It saves PLC limited I/O ports and can get VFD info at the same time. In this page, author programmed S7-200 free port [2] according to the free port protocol.

1.3 System Hardware Compose

EDS1000 series RS-485 terminal and Siemens S7-200 series 226CPU PLC diagram of free communication port 1，show as figure 1 below. PLC is the host，VFD is the slave, communication port by port.

EDS-1000Series Inverter RS-485 Connection port and Siemens S7-200 Series 226CPU Type PLC Free communication
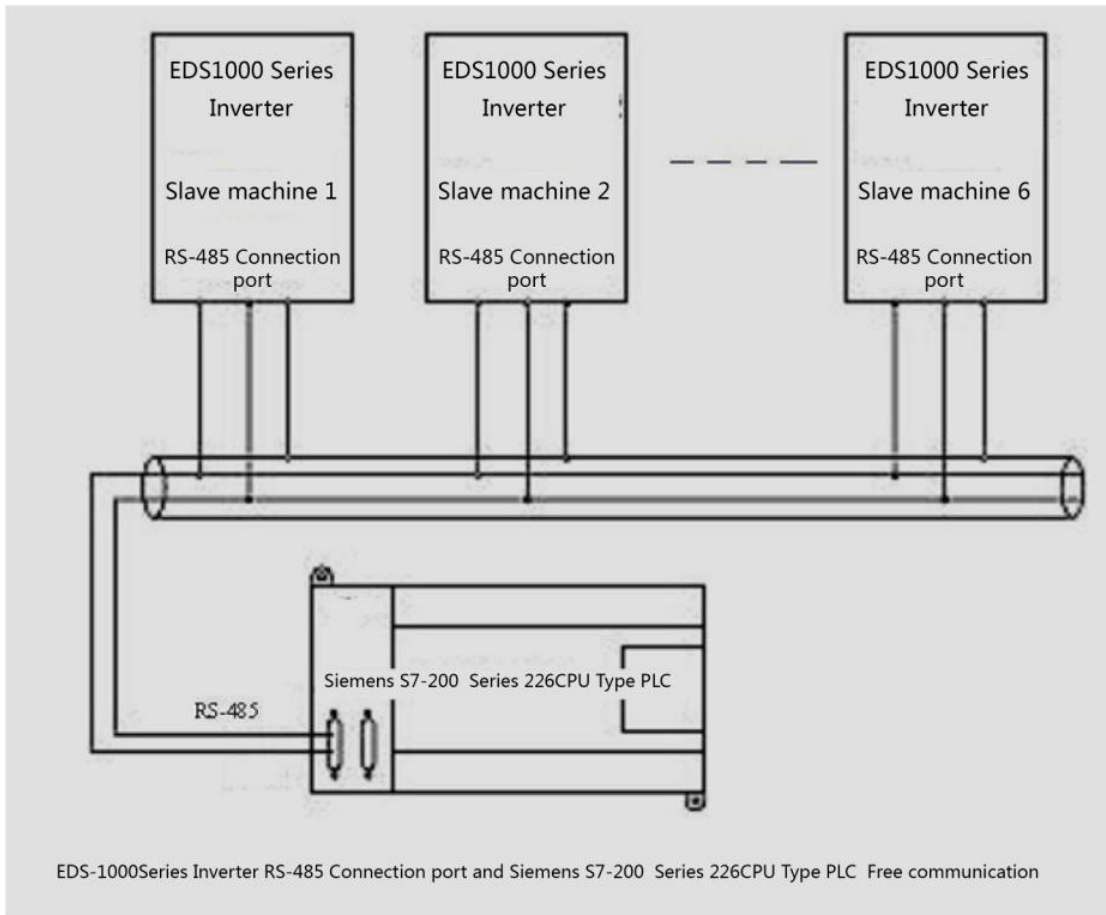
1.4 Hardware Installation.

(1) Press and connect wire one end to RJ45 crystal plug with special press plier, the other end arrange pins as Siemens PLC free communication port, and connect to DB-9 special patch plug.

(2) Connect RJ45 wire to VFD PU terminals, then connect DB-9 special patch plug to S7-200 PLC free communication terminal 1.

2. Inverter Communication Principle

EDS1000 serial communication means asynchronous half duplex and use odd and even number to check. PLC is host, VFD is a slave. System code transmission is controlled by PLC, and at the same time, PLC constantly indicates VFD code of some address and gets response. One PLC can indicates maximum 31 slaves, with repeaters, can add up to 126 slaves, that is, slave address can get maximum 126. During communication, default formal and speed of transmission is 8-N-1, 9600bps. Transmission data command frame formal show as figure 1.

main device command frame format																	
sending order	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	frame head	auxiliary device address	auxiliary device address	main device command	main device command	assistant index	assistant index	command index	command index	set data	set data	set data	set data	checkout sum	checkout sum	checkout sum	checkout sum	frame end
Defi-nition	head	address		command area		Index area				setting data area				checkout area				end
sending byte	1	2		2		4				4				4				1

Data structure as above：

(1) Frame header：Byte "～"（hexadecimal 7E），single byte.

(2) Slave address : Slave local address, two bytes，ASCII form. VFD default setup is 01.

(3) Host command/Slave response：Command indicates by host，response to host command. Use double bytes, ASCII form.

(4) Secondary index/Command index/Fault index：For host，secondary index，command index are used to coordinate with host command to achieve concrete functions. For slave，secondary index, command index are used to report fault status code for slave，command index do not change，report directly. Data type is hexadecimal ，4 bytes ，ASCII form. Command index use low 2 bytes，secondary index use high 2 bytes，data ranges from "00"～"FF".

(5) Checksum：Data implication is frame check，use 4 bytes，ASCII form. Calculate with "slave address" to "operation data" cumulative sum for all bytes ASCII code value.

(6) Frame footer：Hexadecimal 0D，single byte [3].

3. **PLC Programming Example**

Considering to the requirement and practicability of fermentation channel control system, this page mainly advise to setup operation frequency and read parameter of VFD.

VFD operation frequency setup

PLC executes the initial subprogram at the first scanning and setup to communication terminal. This solution, Terminal 1 used to communication. Inverter address is 01. For example: setup value 40.00HZ. Format："～010C00010FA0027C\R"，procedure as below：

Network 1 //first scanning，initialization operation，setup the number of bytes. //

LD SM0.1

MOVB 18, VB199

Network 2 //if SM0.7=1，allow free terminal mode //

LD SM0.7

MOVB 9, SMB130

Network 3 //if SM0.7=0，allow PPI/passive station mode //

LDN SM0.7

R SM130.0, 1

Network 4 // initialization slave operation frequency provide command //

MOVB 0, MB2

MOVB 18, MB3

Network 2 // concatenation character receiving interruption to interrupt procedure 0//

LD SM0.7

ATCH INT_0:INT1, 25

ENI

Network 3 //when MB2=MB3 ，then：counter reset 0，back to initial state //

LDB= MB2, MB3

MOVB 0, MB2

MOVD &VB320, VD316

Interrupt data receiving procedure as below：

　　Network 1 //disconnect interruption，put data into data area //

LD SM0.0

DTCH 25

MOVB SMB2, ＊VD316

INCD VD316

INCB MB2

4. **Epilogue:**

This solution adopts Siemens S7-200 series 226 CPU PLC's free communication terminal 1，and controls EDS1000 series inverter through RS-485 protocol，it simplifies the cable connection，avoids the possible effect of electromagnetic interference to control devices on site.